

## CIMENT FONDU® Rapid Drying

- Concrete surfaces are often covered with epoxies or paints, or with glued materials like carpet, linoleum or hardwood floor.
- Before the application of such surface covering products, it is essential to wait that concrete residual moisture is low enough to ensure proper adherence. For conventional concrete, drying may take several weeks.
- Ciment Fondu® concrete dries out very quickly and it is possible, in most cases, to apply the surface covering within 48 hours after casting.

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### Moisture content of concrete substrate

#### Definitions

##### 1-1 Moisture content

Moisture content is defined as the quantity of free water or vapour contains in the air or in a material.

The moisture of a surface to cover may come from condensation water, running water, infiltrated water (from below) or retained water.

For new concrete, the moisture comes mainly from the excess gauge water - required to provide good workability - that has not been bound by the hydration of cement. This residual water remains at free state within concrete pores and could evaporate over time.

Concrete moisture is also influenced by external sources like rain, condensation or moisture from the ground.

##### 1-2 Residual moisture content

The residual moisture content is the ratio between the free water (i.e. evaporable water) and the dry weight of concrete, at time of observation. The residual moisture content is usually expressed in percentage. It is also sometimes called dryness level.

##### 1-3 Test methods to determine residual moisture

In situ residual moisture of a concrete substrate can be evaluated by various methods:

###### Pin Moisturemeter

Since electrical conductivity of concrete varies with water content, a tension is applied between two or several pins in contact with concrete; residual moisture content is estimated from current measured. Pins can be applied on the surface or under the surface through holes.

###### Impedance Moisturemeter

This is another method based on the variation of electrical properties of concrete with water content. One or several pairs of electrodes transmit low frequency signals allowing to determine concrete moisture

###### Air Moisture Measurement

In a hole drilled within concrete, an air moisture probe is sealed. It takes several hours for air moisture within the sealed hole to reach equilibrium with the surrounding concrete.

###### Calcium Carbide Device

This method requires to remove a small sample of the concrete slab. The sample is ground and put in a sealed vessel where moisture reacts with calcium carbide. Residual moisture is evaluated from the pressure increase within the device.

###### Moisture by Drying

This is another destructive method where a sample is dried in oven at 110°C. Weight before and after drying permits to determine residual moisture. This method is rarely utilised on job sites due to equipment and time required.

##### 1-4 Maximal Moisture Content

Various Specifications Documents prescribe that residual moisture content of a concrete substrate should not exceed 3% (by mass) at time of applying a covering material. It is appropriate to verify also the manufacturer specifications of the covering material applied.

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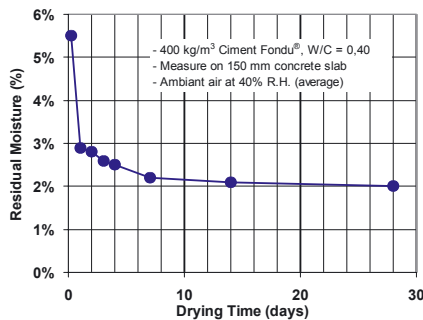
## Drying of Ciment Fondu® concrete

The rate of drying of concrete depends on two different phenomena:

- Cement hydration: a more or less rapid process depending on the cement utilised and ambient temperature.
- Evaporation of free water: always a slow process due to limited porosity of concrete.

The hydration of Ciment Fondu® is much faster than usual cement, and it permits to lower the residual moisture content below the 3% threshold limit within 48 hours, or even less if weather conditions are favourable. The following graph shows the evolution of residual moisture level of a concrete made with 400 kg/m<sup>3</sup> of Ciment Fondu® and a Water/Cement ratio of 0.40.

**Evolution of residual moisture content within a 150 mm thick Ciment Fondu® concrete slab - Measured by Impedance Moisture Meter (Independent Laboratory)**



For comparison, a concrete made with Ordinary Portland Cement requires several days or weeks to reach the 3 % threshold.

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## Influence of external conditions

The influence of atmospheric conditions is marginal on the early evolution of residual moisture within a

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Ciment Fondu® concrete slab. However, concrete surface must be protected from rain and condensation until application of the covering material.

When a rapid drying is required, curing concrete with water is not appropriate.

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## Shrinkage of Ciment Fondu® concrete

Certain floor coverings, such as products containing resin, do not adapt well to the dimensional variations resulting from expansion or shrinkage of the substrate to which they are applied. Before the application of these coatings, it is therefore essential to make sure that the majority of the concrete shrinkage is completed.

The shrinkage corresponds to the reduction in volume of the concrete. For all concretes with hydraulic binders the shrinkage is cumulative with time. There are various types of shrinkage: plastic shrinkage, thermal shrinkage, hydraulic shrinkage and drying shrinkage.

The unique rapid hardening of Ciment Fondu® concrete means that the shrinkage also takes place much faster. After 48 hours, typically 60 % of the total shrinkage will have occurred, as illustrated below.

**Evolution of % of 90 days shrinkage on 70x70x280 mm concrete beams (Independent Laboratory)**

